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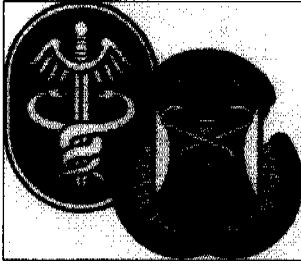
## Module 5: Dietary Supplements: A Basic Guide

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This module of Performance Nutrition will investigate misleading nutritional information. This includes how the marketing of ergogenic aids and dietary supplements creates a false idea of what leads to good nutrition and performance and how the use of some of these products may hinder performance and pose a health risk.

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## Introduction

What you eat can help you achieve optimal performance in military training and athletics. Nutrition experts recommend a balanced diet that is high in carbohydrate and low in fat to help you achieve your peak level of performance.

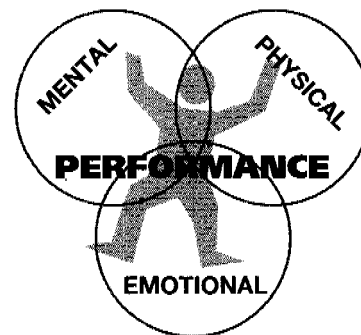
Many people, however, think they need more than food and water to perform their best and to be in good health. Throughout history, athletes have looked for that "magic potion" to help them run faster and jump higher.

Supermarkets, pharmacies, natural food stores, and nutrition store shelves are full of products that are supposed to help us lose weight, build muscles, prevent disease, and give us better health. Sports magazines are sprinkled with ads for powders, pills, and bars that promise quick and easy answers to performance nutrition.

What can you believe? What products can help performance? Which ones have no effect on performance? Which ones can be harmful?

This material will discuss some of the myths and facts of dietary supplements and show you how to be a critical nutrition consumer.

## The Elements of Military Performance



What, when, and how much you eat affect all of these elements.

## Check Your Vitamin & Mineral IQ

How much do you know about which foods are the best sources for the vitamins and minerals you need? Rate the following foods in order of their quality for a particular nutrient:

1 = best source      2 = medium source      3 = least effective source

### For Vitamin C

- ☐ a) Apple
- ☐ b) Orange
- ☐ c) Banana

### For Thiamin

- ☐ a) Enriched white rice
- ☐ b) Mashed potatoes
- ☐ c) Cooked tomatoes

### For Iron

- ☐ a) Cheddar cheese
- ☐ b) Beef steak
- ☐ c) Chicken

### For Vitamin E

- ☐ a) Butter
- ☐ b) Shortening
- ☐ c) Corn oil

### For Vitamin A

- ☐ a) Corn
- ☐ b) Asparagus
- ☐ c) Carrots

### For Potassium

- ☐ a) Tomato juice
- ☐ b) Banana
- ☐ c) Sports Drink

### For Calcium

- ☐ a) Skim milk
- ☐ b) Whole milk
- ☐ c) Plain yogurt

### For Zinc

- ☐ a) Beef liver
- ☐ b) Chicken breast
- ☐ c) Ground beef

### For Vitamin B-12

- ☐ a) Kidney beans
- ☐ b) Potatoes
- ☐ c) Peas

### For Riboflavin

- ☐ a) Orange juice
- ☐ b) Milk
- ☐ c) Beer

Know where to get the vitamins and mineral you need. Answers found on page 5-14.

## KEY CONCEPT

Misleading nutritional information, including the marketing of ergogenic aids and dietary supplements, creates a false idea of what leads to good nutrition and performance; this may hinder performance and pose a health risk.

## OBJECTIVES

With this material you will learn to:

- ▲ Define dietary supplements and ergogenic products and give examples of each.
- ▲ Identify the truth regarding the benefit of some common dietary supplements and ergogenic aids.
- ▲ Specify how and when sport drinks could be incorporated into the diet to enhance training and recovery.
- ▲ Identify good sources of information on performance nutrition and dietary supplements.
- ▲ Identify how to avoid nutrition misinformation.

## Why Take Dietary Supplements?

People take dietary supplements for different reasons. They may want more of some specific nutrients, such as carbohydrate, protein, fat, vitamins, minerals, electrolytes and fiber, than they are getting in their diet.

Although dietary supplements are not usually necessary for health, they provide a convenient and practical way to obtain increased requirements of nutrients brought on by lifestyle, exercise, or medical demands. In some cases, dietary supplements can help prevent or reverse a dietary deficiency that can't be taken care of with food alone.

There are also dietary supplements that are used as **ergogenic aids**. These are products people take in hope of improving physical performance, having more stamina or becoming stronger, faster or thinner. Many want to believe there is a magic pill to enhance appearance or performance.

### Do Dietary Supplements Work?

Some dietary supplements do help improve performance and health. For example, the carbohydrate in sports drinks definitely helps boost your body's glycogen stores to give you additional energy in physical activity that lasts longer than 90 minutes.

Iron supplements can treat anemia. Calcium supplements are valuable additions to diets of those who may need more calcium than they get in food to maintain strong bones.

Other dietary supplements, such as vitamin supplements and amino acids, are not necessary because food can generally supply all nutrient needs.

Some dietary supplements can be risky. Overdoses of some supplements have side effects that can hurt health and performance. And some dietary supplements can cause allergic reactions.

## What is a Dietary Supplement

Dietary supplements may include the following substances: vitamins, minerals, herbs, or other botanicals, amino acids, hormones, as well as product combinations. These products are intended for ingestion as capsules or powders and not as they ordinarily occur in conventional foods, meals, or diets.

## Ergogenic Aids:

*"Ergogenic" means "work producing."*

Ergogenic aids are dietary supplements that are supposed to increase your physical and mental performance.

Many dietary supplements have absolutely no performance or health benefit. An example is bee pollen, which is promoted as a substance that can help you recover sooner after exercise, has no effect on recovery, speed or endurance.

A supplement such as bee pollen can create a *placebo effect*, however. Users who think bee pollen will help them recover faster after a strenuous workout, may indeed think they are having a quicker recovery.

## No Magic Potion

There are no quick and easy potions that will boost your performance in military training or in athletics. If you're looking for a miracle, chances are, all you'll discover are:

- ▲ Disappointment – A dietary supplement that promises to improve your performance all by itself cannot do what it promises. You achieve top performance with training and conditioning, a positive attitude, good nutrition and natural ability.
- ▲ Poor Taste – The fact is many dietary supplements taste bad. Nutrients in food are much tastier.
- ▲ High Cost – Dietary supplements are high priced nutrients. Food is a better source of nutrition and much cheaper.

- ▲ Possible Health Risks – If you use supplements to replace food, you could be missing out on the balance of nutrients you need for top performance and health. If you use supplements to delay medical treatment, you could endanger your health.

Some dietary supplements, such as bee pollen, have caused **allergic reactions**. Others, including even the beneficial nutrients Vitamins A and B6, can be **poisonous** if you take too much of them.

## Fact Or Fiction

There are some products that, when combined with a balanced performance diet and the right kind of physical training, can help performance. Other products have no effect on performance. Let's examine some popular dietary products and practices to see which may benefit your training performance and which will not be of benefit.

**The Claim:** You should take vitamin and mineral supplements for extra energy and strength during heavy physical activity like athletic competition and military training.

**The Facts:** Vitamins and minerals do not give you energy or strength. Energy means calories, not get-up-and-go, and vitamins and minerals themselves have no calories. Carbohydrates, fats, and proteins provide energy. Vitamins and minerals help your body get the energy it needs from carbohydrates, proteins and fats. Weight training or resistance training builds strength.



You can get vitamins and minerals from two sources — food and dietary supplements. If you eat a performance diet, you should be able to get all of the vitamins and minerals you need for performance and health from food.

Vitamin and mineral deficiencies are rare in people who eat regular, nutritionally balanced meals. If you are not eating a balanced diet, a daily multivitamin and mineral supplement that supplies 100% of the Percent Daily Value (DV) is enough to help you get your vitamin and mineral requirements.

Look for the USP notation on the label.

This indicates that the product meets specific standards of quality, purity and potency established by the U.S. Pharmacopoeia.

Multi-packs of vitamin supplements and high doses of individual vitamins and minerals generally have no benefit for performance. It is not true that if a little is good, more is better. These products are very expensive and the claims made are exaggerated and unproven.

## YOU CAN HAVE TOO MUCH OF A GOOD THING

Some beneficial vitamins and minerals can be harmful to performance and health when you take too much of them.

### TOO MUCH ...

Vitamin A	Severe headaches, bone and joint pain, dry skin, liver damage.
B6	Muscular weakness, nerve injury, and altered touch sensation.
Niacin	Fatigue during exercise, liver damage.
Iron	Liver damage, possible colon cancer, possible heart disease.
Zinc	Stomach erosion, impaired body defense systems, anemia.

*Consult your primary health care provider, a dietitian, or a pharmacist before taking supplements of individual vitamins and minerals or high-dose multi-nutrient preparations.*

In most cases, if you eat following the Food Guide Pyramid you won't need a supplement.

## SOME PERFORMANCE CHOICES FOR VITAMINS & MINERALS

<b>Iron</b> - Needed for oxygen transport and energy release in working muscles.	<b>Good Sources:</b> Lean beef, organ meats, chicken, fish, oysters, clams, baked beans, spinach, prunes, raisins, dried figs, whole grain and enriched or fortified breads and cereals.
<b>Calcium</b> - Strengthens bone. Needed for muscle contraction and nerve function.	Lowfat milk, lowfat cheese, yogurt, cottage cheese, fortified orange juice, rhubarb, broccoli, canned fish with bones, tofu.
<b>Vitamin A</b> - Needed for night vision, healthy skin and to fight infection.	Dark, leafy green vegetables such as spinach; also squash, pumpkin, carrots, sweet potatoes; cantaloupe, milk, milk products, eggs, liver.
<b>Vitamin C</b> - Needed to produce and maintain protein for tissue and bone; Helps the body absorb iron and calcium.	Strawberries, oranges, grapefruit, cantaloupe, green pepper, orange juice, grapefruit juice, broccoli, tomato, cauliflower, baked potatoes, cabbage.
<b>Vitamin D</b> - Is essential for normal bone growth.	Fortified milk and yogurt; sardines, salmon and other salt-water fish; shrimp, margarine, liver, beef.

## When A Vitamin & Mineral Supplement Can Benefit!

There is no scientific evidence that shows that taking extra vitamins and minerals improves performance. But there are some situations when a vitamin or mineral supplement may help you meet your needs.

- ▲ When you are dieting, It's difficult to get all of the nutrients you need if you're consuming fewer than 1500-1800 calories a day.
- ▲ When you don't eat enough calories to support heavy physical activity - You may not be getting all of the nutrients you need if you aren't consuming the number of calories you burn in training and exercise.
- ▲ When you can't or choose not to eat regular, nutritionally balanced meals.
- ▲ When women train they may need iron and/or calcium supplements
  - A combination of heavy physical training and inadequate calories can cause loss of menstruation. The hormonal changes that occur when menstruation stops contribute to calcium loss from bones, increasing a woman's risk for stress fractures and osteoporosis.
  - Women may need iron supplements to replace iron lost in blood during menstruation and iron lost in sweat.
- ▲ When you can't eat foods from the entire food group, such as dairy foods due to lactose intolerance.

*Beware ...  
megadoses of vitamins  
A, D, E & K,  
fat soluble vitamins,  
are stored in the body  
and may produce toxic  
effects!*

## The

**Claim:** Carbohydrate loading, which can be achieved with food and dietary supplements, improves endurance and performance.

## The

**Facts:** Carbohydrate loading can improve endurance and performance in heavy physical activities that last 90 minutes or more.

Carbohydrate loading is when you consume a much higher than normal amount of carbohydrates — 70% of your calories — several days before an event. At the same time, you cut back your level of activity to allow reserves of glycogen to build up in your muscles and liver.

Studies show that the extra carbohydrates are stored as additional energy-giving glycogen that lasts longer than your normal reserves. Normal glycogen stores usually start to dwindle after 90 minutes of continuous exercise.

**But** — carbohydrate loading does not give you any performance advantage for activities that are shorter than 90 minutes. Many training events do not last 90 minutes or are not continuous.

Military training schedules also make it difficult for carbohydrate loading to benefit performance. If you cannot curtail your activity for 2 or 3 days before an event, you'll continue to burn the extra carbohydrates. Not enough will be stored to make a difference.

Be advised that carbohydrate loading can hurt performance. It can cause stiffness and a heavy feeling in your muscles.

Your best bet for getting enough carbohydrate is to replenish your glycogen stores every day with a diet that is at least 55-60% carbohydrate — at least 400 grams of carbohydrate a day.

If you want to try carbohydrate loading, talk to a dietitian first.

## Sources Of Carbohydrates

**Food:** contains plentiful amounts of carbohydrate. For example:

2 cups pasta	80 grams of carbohydrate
1/2 cup raisins	60
4 slices bread	48
1 cup rice	50
1 large baked potato with skin	50
1 cup corn	40
3 - 4" pancakes	36
1 cup cooked dried beans & peas	35-55
1 bagel	30-40
8 oz. fruit juice	25-35
1 oz or 20 mini-pretzels	25
8 oz. skim milk	12
1 med fresh fruit	10-30

**Fluid Replacement Drinks:** with no more than 12% carbohydrates. Higher carbohydrate levels may cause stomach cramps and diarrhea, and may impair fluid absorption. Examples include (per 8 fl. oz):

All Sport (7%)	17
Gatorade (6%)	14
10-K (6%)	14
Power Ade (4%)	9

- ▲ Good for fluid and carbohydrate replacement in events lasting longer than 90 minutes.
- ▲ Not a significant source of carbohydrates for carbohydrate loading.

**Meal Replacements:** can replace an occasional meal because they are high in carbohydrate and include some protein, fat, vitamins, and minerals. Examples: Power Bar, Exceed Nutritional Beverage, Meal-On-The-Go, and GatorPro.

	Carbo Grams	Protein Grams	Fat Grams
GatorPro, 8 oz. serving	58	6	7

- ▲ Good supplement if you can't get enough calories from meals.
- ▲ Not good for replacing food on a regular basis. Low in fiber and missing some vitamins and minerals.
- ▲ Liquids are good pre-activity meals because they take less time than food to empty from the stomach.
- ▲ Convenient to pack during exercise.

**Carbohydrate Supplements:** are generally a liquid greater than 10% carbohydrate with no protein or fat. For example, per 8 fl. oz:

Carbofuel	80 grams of carbohydrate
Exceed High Carbohydrate Source	57
Carboload	47
Carboplex	54

- ▲ Good supplement if you have trouble meeting daily carbohydrate needs.
- ▲ May be easier than solid food to tolerate right before or after activity.

**The Claim:** Athletes and active people need **protein supplements** and amino acid supplements for energy, strength, power or to build muscle.

**The Facts:** This is not true. Even with increased activity or weight training to build muscle mass, you do not need amino acid supplements or protein supplements. It's true that for prolonged and intense physical training, you need more protein than you do when you are moderately active. Protein repairs and builds your hard working muscles.

But even then, only 12-15% of your calories, or 75-150 grams, needs to come from protein. You can easily get that protein requirement from food, even for intense activity or bodybuilding.

Reliable studies have shown that taking two to three times the recommended amount of protein does not enhance performance, muscle strength or muscle size. Excess protein is converted to fat, which builds fatter bodies, not bigger muscles.

Too much protein can hurt performance. If you're eating excess protein, you may not be getting enough carbohydrate, the nutrient you really need for performance energy and to build muscle mass. Many high-protein foods, such as eggs and meat, also are high in cholesterol and fat, which increase your risk for heart disease.

Excess protein can damage your kidneys. It makes you urinate more, increases your risk of dehydration, and takes valuable calcium from your body. If you do not get enough carbohydrates, you will break down body proteins—your muscles—for energy. So if building muscle is a priority, a high-carbohydrate diet would be of greater benefit than a high-protein diet.

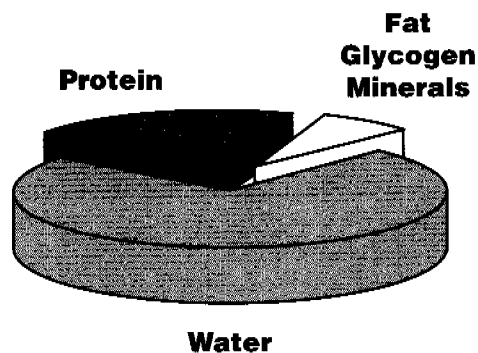
## How Much Protein Does It Take To Build Muscle?

### Muscle Is ...

70-75% Water

15-20% Protein

5-7% Fat,  
Glycogen,  
Minerals



▲ One pound of muscle contains 70-105 grams of protein.

▲ To add one pound of pure muscle in a week:

- You need 10-14 grams of additional protein a day. That's the equivalent of two ounces of meat or cheese, or two glasses of milk a day.
- If you increase your weekly protein intake by more than 28 grams over the 80-120 grams of protein you should be getting in a performance diet, you are taking in excess protein.

▲ But protein alone won't build muscles. Muscle building requires:

- Strength training.
- Extra calories — 500 a day, from carbohydrate is best — to add a pound of muscle a week .

## Protein Supplements

Protein supplements are powder, pill and liquid forms of the same protein you get in food. They cost more than food and often taste bad. And the protein in an expensive can of protein powder does no more to build muscle than the same amount of protein from inexpensive foods such as tuna fish or peanut butter.

In fact, food is usually a better source of protein. Compare the grams of protein in these common foods to a serving of a typical protein supplement.

PROTEIN SOURCE	GRAMS OF PROTEIN
Protein supplement – 1 serving	18
1/2 6 1/2 oz can of tuna fish	25
1/2 chicken breast w/out skin	27
8 oz glass of milk	8
8 oz milk with instant breakfast powder	16
1 slice cheese pizza	8
whole 12" cheese pizza	64

## Amino Acid Supplements

Amino acids are the building blocks of protein. When you eat protein, your body breaks it down into a balance of different kinds of amino acids, then rearranges them into the protein your body needs.

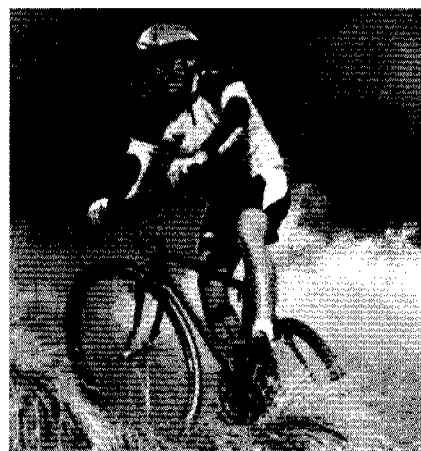
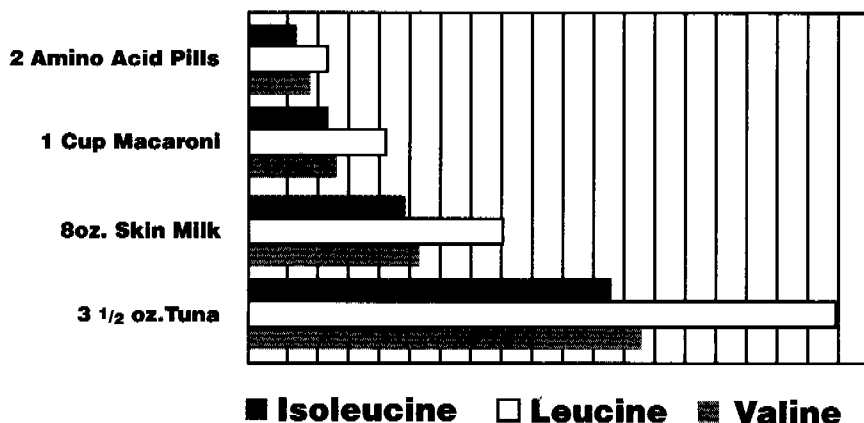
Amino acid supplements, which come in powder, pill and liquid form, are touted as the latest miracle for muscle building and recovery from endurance events, such as marathons. But research has not shown that amino acid supplements build muscle, increase strength, reduce fat, or reduce recovery time after physical activity. Furthermore, safety of their long term use has not been proven.

Like protein supplements, amino acid supplements are expensive and taste bad. They may have side effects, such as headaches and diarrhea, which can hurt your performance.

As with protein, you can get all the amino acids you need from food. If you use amino acid supplements, you might not get the balance of different amino acids you need.

It's easy and cheap to load up on amino acids. Take a look at the amounts of branched-chain amino acids—promoted as necessary for muscle gain and rapid recovery from exercise—in a popular supplement and three common foods. The amino acids in these foods are used just as well as the amino acids in the pills.

### Sources of Amino Acid:



**The Claim:** Fasting cleanses the body, helps improve performance and increases endurance.

**The Facts:** This is false.

Cutting out food before physical activity is like not putting gas in your car for a long trip. You'll probably run out of fuel before you reach your destination.

When your body stops getting food, your normal energy storage process is disrupted. When you don't refuel your body with food, you can't replace energy-giving glycogen in your liver and muscles.

If you fast for more than 12-14 hours, your body begins to literally munch on itself for energy. In the process, you lose water, muscle tissue, glycogen and vitamins and minerals—all of the things you need for top performance.

Fasting reduces endurance. You can't go as long if you don't have a good store of glycogen. Fasting causes dehydration and lowers your blood sugar, which slows your reaction time and lowers your concentration.

Fasting does not cleanse the body. Fasting floods the body with toxins that were trapped in the liver and fat cells.

*Fasting, for a prolonged period of time, can be dangerous to your health. Eating regular meals and high carbohydrate snacks before and after activity is the best way to improve performance and increase endurance.*

## **The**

**Claim:** Sports drinks are needed to replace fluids, carbohydrates, sodium and other electrolytes lost through sweating.

## **The**

**Facts:** Sports drinks are not required to replace water, carbohydrates or electrolytes, although, in some situations, they may be a better choice. Water is all that most people need to stay hydrated in intense activity.

Sports drinks have no effect on performance in activities lasting less than an hour, and you can replace electrolytes after an activity with food.

However, there are some times when sports drinks can benefit performance. For continuous activity lasting longer than 90 minutes, the carbohydrates in sports drinks can help back up dwindling glycogen stores to give you endurance energy. And the electrolytes in sports drinks help your body absorb fluids faster.



*For maximum hydration,  
drink water before,  
during, and after activity—  
1/2 to 1 cup every 15–20 minutes.*

For an activity lasting longer than 90 minutes, fruit juice diluted with water or sports drinks with less than 12% carbohydrate may improve performance.

## **The**

**Claim:** Caffeine improves performance.

## **The**

**Facts:** Caffeine may help some people improve their endurance. However, caffeine is less effective in improving endurance in habitual caffeine drinkers. Excess caffeine can cause nervousness and jitters, which can reduce marksmanship accuracy.

*You shouldn't consume more than  
1–2 cups of caffeinated coffee, tea, or soda a day.*

Caffeine is a diuretic, which increases urination and may lead to dehydration. If you consume caffeine before or during training, drink a cup of water at the same time.

## **The**

**Claim:** Salt tablets are good for replacing electrolytes lost in sweat during training and field exercises.

## **The**

**Facts:** Salt tablets are not beneficial in any way for use in heavy physical activity.

Salt tablets should not be taken before, during, or after training or competition. Period.

When you sweat you need to replace water, not salt. Salt tablets dehydrate you internally. They pull water away from working muscles and other parts of the body, where you really need the water.

Salt tablets can build dangerously high concentrations of salt in your blood, which can lead to muscle fatigue, cramping and kidney problems.

*Do not take salt tablets  
before, during, or after  
training.*

## Too Good To Be True? Probably!

You have to be a careful consumer when it comes to dietary supplements. Manufacturers and sellers of these products want you to believe that you need dietary supplements for top performance and health.

Be advised that many dietary supplements touted as performance enhancing or weight loss aids provide little if any benefit beyond that attainable with a safe, effective physical training program and a healthy diet.

Although dietary supplements are legal for sale in the United States, this does not mean that they are effective as claimed or that they are without negative side effects. Also, just because something is "natural" doesn't mean it is safe. Many natural substances can cause harm. Approach these products with a healthy skepticism and avoid the use of non-proven supplements.

Current law does not require manufacturers to provide proof regarding supplement claims, nor does it require them to provide proof of safety.

Although specific health claims cannot be made on a supplement label without scientific research to support it, manufacturers still have a lot of leeway to promise results. Brochures, posters, or advertisements in magazines or on TV may be used to present claims that cannot appear on product labels.

Reliable scientific research continues to show that with only a few exceptions, these products do not work as their manufacturers would have you believe. Even with substances that might work, many manufacturers put just enough buzzwords on the label to catch your attention, but not enough to give you solid information about the proven performance benefit.

Before you take a nutritional supplement, do some research about the product. Don't be fooled by advertising hype. Always tell your health care provider about dietary supplements (to include herbal preparations) and other products you are taking. Dietary supplements may cause side effects when taken with certain medications.

### Some Advertising Techniques To Be Wary Of

▲ **PROMOTIONAL LITERATURE:** Beware of material that is placed next to a product but doesn't name the product. That could be a flyer or newsletter that promises things about a product that can't be put on the label. This is one way manufacturers can get around labeling regulations.

▲ **INFOMERCIALS:** There are no restrictions on what manufacturers can say on the air about their products. Infomercials are really just long commercials packaged like talk shows.

▲ **EDITORIALS AND ARTICLES IN FITNESS, HEALTH AND NUTRITION MAGAZINES:** Are advertisements for the product promoted in the article placed across from the ad? Who wrote the article? Does small print at the top or bottom of the article say "Paid Advertisement" or "Advertising Supplement?"

▲ **UNSUBSTANTIATED CLAIMS:** If it sounds too good to be true, it probably is! Beware of claims that use :

*miracle!!!* Newly Discovered!!! **SUPER**  
**latest scientific discovery ...**  
**ADVANCED** ➡ **ultra**  
**MEGA** ...professional ... **BLAST!**

▲ **"MEDICAL EXPERTS":** Actors or other people are used to mimic real scientists or health professionals. Anyone can use the title of nutritionist without getting a license or passing an exam.

▲ **"TESTS" USED TO PROVE A CLAIM:** Many claims for dietary supplements are based on poorly-controlled studies, locker room talk or reports from research that are taken out of context. Suspect claims when a registered dietitian or physician is not involved.

## Does it Work?

DIETARY SUPPLEMENT	WHAT IT IS.	ERGOGENIC CLAIM	DOES IT WORK?
Androstenedione	Substance produced by the adrenal glands and testes.	Increases energy, strength and muscle development. Decreases recovery time from workouts.	<i>Take only under the direction of a physician.</i> Anyone with a family history of prostate or breast cancer should avoid taking androstenedione. Banned as anabolic steroid by the International Olympic Committee. Adverse effects in males include breast enlargement, testicular shrinkage, and infertility, and in females include increased facial and body hair, voice deepening, and clitoral enlargement.
Arginine, Ornithine & other amino acids	Amino Acids (protein components found in most foods).	Stimulates production of human growth hormone (hGH). Increases muscle growth, decreases body fat.	Some studies show possible increased muscle growth related to hGH but <i>amounts needed to stimulate hGH are extremely high &amp; potentially dangerous.</i>
B-Complex	Water-soluble vitamins found in foods, not stored in body; includes thiamin, riboflavin, niacin, folic acid, biotin, panthothenic acid, B6 & B12.	Increases performance & energy.	<i>Inadequate evidence to support the claim.</i> Although exercise may increase the body's need for vitamins, these needs are easily met by increased food intake.
Bee Pollen	Bee saliva, plant nectar & pollen. Often sold with other nutrients added, contains nucleic acid.	Enhances athletic performance, faster recovery.	<i>Inadequate evidence to support the claim.</i> Allergic reactions documented, including anaphylactic shock. Avoid if you have a history of gout or renal disease.
Beta-Hydroxy Beta-Methyl Butyrate (HMB)	A breakdown product of the essential amino acid, leucine, which is found in protein containing foods.	Slows the loss of muscle mass associated with intense training, improves strength.	<i>Inadequate evidence to support the claim in trained athletes.</i> May have benefit for untrained individuals who begin resistance training.
Carnitine (L isomer)	A vitamin-like compound that assists in transporting free fatty acids into the mitochondria of muscle cells for use as fuel.	"Fat burner", delays onset of fatigue, improves aerobic exercise and endurance.	<i>Inadequate evidence to support the claim.</i> Not harmful at recommended doses. Potential adverse effects include nausea, vomiting, and stomach cramps. It is important to remember that the "U isomer is the active form. If you ingest the "D" form, you can actually create a carnitine deficiency in yourself. READ THE LABEL!
Choline	Constituent of cell membrane.	Decreases body fat, delays fatigue, faster recovery.	<i>Inadequate evidence to support the claim.</i> Supplements cause diarrhea, foul-smelling intestinal gas, and may cause a "fishy" body odor.

## Does it Work?

DIETARY SUPPLEMENT	WHAT IT IS.	ERGOGENIC CLAIM	DOES IT WORK?
<b>Chromium Picolinate</b>	Chromium is an essential element for metabolism of carbohydrate, protein, & fat. Picolinate is a byproduct of amino acid tryptophan.	Increases muscle mass, burns body fat.	<i>Inadequate evidence to support the claim.</i> Exercise increases chromium losses but adequate chromium available in diet. In animal models, high dosages have been found to damage DNA.
<b>Coenzyme Q<sub>10</sub> (COQ10)</b>	An enzyme component found in the mitochondria of cells. It is a potent anti-oxidant.	Increases energy and cardiac performance.	<i>Inadequate evidence to support the claim for athletes.</i> This substance has been used with therapeutic success in patients with heart disease to increase their oxygen utilization and exercise performance. It has also been shown to increase sub-maximal and maximal exercise capacities in sedentary men. Also to reduce fatigue in patients suffering heart failure.
<b>Copper, Magnesium and Zinc</b>	Essential trace minerals that are required for optimal physiologic functioning.	Improves energy metabolism, improves muscle strength and endurance.	<i>Adverse effects at high doses include gastrointestinal disturbances, mineral imbalances, and toxicity may occur.</i> Supplementation is only necessary when dietary intake is insufficient. If insufficient levels are suspected, contact your health care provider.
<b>Creatine Monohydrate</b>	Increases the creatine phosphate reservoir for ATP-CP energy system, which is used by the body for the first twelve to thirteen seconds of activity.	Increases muscle growth, enhances performance in sprint/speed-oriented sports and short periods of high intensity exercise.	<i>Inadequate evidence to support the claim.</i> May have benefit for short, high-intensity sports work, but may decrease performance in aerobic endurance activities. Often causes weight gain that can be mistaken for increases in muscle mass - this may be water retention not increased muscle. Adverse effects include dehydration, muscle cramps, diarrhea, and unwanted weight gain.
<b>DHEA (Dehydroepiandrosterone)</b>	A substance produced naturally by the human adrenal gland.	Burns fat, builds muscle mass, and slows aging.	<i>Inadequate evidence to support the claim.</i> DHEA is banned by the International Olympic Committee because it is a precursor of the hormone, testosterone. Adverse effects in males include breast enlargement, testicular shrinkage, and infertility, and in females include baldness, increased body hair, and voice deepening. May also cause oily skin and acne.
<b>Ephedra (Ma Huang)</b>	A potent herb. The active constituent is ephedrine alkaloid. Often found in products that claim to boost metabolism and promote weight loss.	Increases metabolism and stimulates weight loss.	<i>Potentially life threatening. Adverse effects include rapid heart rate, increased blood pressure, increased risk of heat injury, depression, agitation, rhabdomyolysis, heart attack, stroke, convulsions and death.</i> Exercise and dehydration increase the risk of these effects. Caffeine also increases the effects of ephedrine alkaloids, so soldiers are advised to minimize caffeine consumption (from coffee, colas, or other dietary supplements) if taking them. Avoid ephedrine alkaloids if taking a monoamine oxidase (MAO) inhibitor or allergy, asthma, or cold medication containing ephedrine, pseudoephedrine, or phenylpropanolamine.

## Does it Work?

DIETARY SUPPLEMENT	WHAT IT IS.	ERGOGENIC CLAIM	DOES IT WORK?
Fructose	Naturally occurring sugar in fruit.	Enhances endurance performance.	<b>Adverse effects include intestinal distress &amp; may increase lactic acid which impairs performance.</b> May spare muscle glycogen early in exercise, but no benefit to performance found. Primarily used by the liver. Not recommended to consume immediately before exercise or as the sole sugar in a sports drink.
Gamma Butyrolactone (GBL)	Converted in the body to the drug gamma-hydroxybutyrate (GHB).	Enhances athletic performance, releases growth hormone, prolongs life.	<b>Potentially life threatening. Converted by the body into gammahydroxybutyrate (GHB), a drug banned by the FDA.</b> Adverse effects of toxicity include coma, slow heart beat, slow breathing, hypothermia, seizures, and vomiting.
Gelatin	Connective tissue protein derivative.	Increase energy source to muscles, prevents muscle soreness, muscle strength & endurance.	<b>Inadequate evidence to support the claim.</b>
Ginseng	A plant root.	Increases energy; increases work capacity, reduces fatigue, improves memory.	<b>Possibility of allergic reactions. Long term use may cause high blood pressure, sleeplessness, breast nodules.</b> Although contains chemicals which may increase endurance and promote recovery, commercial preparations contain little to none of the active compounds. Some studies show favorable result for stress reduction but no evidence improves exercise or sexual performance. Some liquid products contain alcohol.
Glandulars	Ground up animal organ tissue, usually testes, pituitary or hypothalamus.	Elevates testosterone levels promoting muscle growth.	<b>Inadequate evidence to support the claim.</b>
Glutamine	An amino acid found in high concentrations in animal proteins.	Prevents the loss of muscle mass, enhances the immune system.	<b>Inadequate evidence to support the claim for athletes.</b> Adequate consumption of glutamine does aid the immune system in times of stress.
Glycerol/ Glycerin	Sweet, oily fluid found in many foods.	Improves endurance performance by optimizing hydration.	<b>Inadequate evidence to support the claim.</b> When ingested with water, glycerol seems to hold onto the water, thereby delaying the onset of dehydration. No known risks if food grade glycerol is used and dose does not exceed 1 g/kg body weight every six hours.
Kava	A member of the pepper family.	Relieves nervous anxiety, stress, insomnia and restlessness.	<b>Studies show benefit relieving mild anxiety and insomnia.</b> Kava may impair your ability to operate machinery. Do not use in conjunction with other antidepressant or anti-anxiety medications.

## Does it Work?

DIETARY SUPPLEMENT	WHAT IT IS.	ERGOGENIC CLAIM	DOES IT WORK?
<b>Hydroxy citrate (HCA)</b>	An herbal compound from the Brindallberry plant (genus <i>Garcinia</i> ).	Enhances weight loss.	<i>Inadequate evidence to support the claim.</i> May inhibit production of cholesterol and consequently steroid hormones, therefore should be avoided by pregnant and lactating women, children and diabetics.
<b>Inosine</b>	Nucleoside; various functions in metabolism.	Increases endurance & strength.	<i>Inadequate evidence to support the claim.</i> Constant use may cause fatigue. Those with gout should avoid.
<b>Lecithin</b>	Phospholipid found in cell membrane. Functions in fat metabolism. Contains choline.	Dissolves cholesterol, prevents fat gain.	<i>Inadequate evidence to support the claim.</i> Humans make adequate amounts. The synthetic forms are not well absorbed. Form of choline in lecithin is better absorbed than free choline.
<b>Niacin</b>	An essential vitamin.	No ergogenic claims.	<i>Can have a negative impact on aerobic performance at high doses(3-9 gmAday) by inhibiting the release of free fatty acids.</i> High doses can produce flushing and diarrhea.
<b>Pangamic Acid (Vitamin B15)</b>	Not a true vitamin. Mixture of calcium compound & gluconate. May contain variety of compounds .	Improves endurance by aiding oxidative metabolism by increasing muscular creatine phosphate & glycogen.	<i>Inadequate evidence to support the claim.</i> Several of the compounds marketed under this name are potentially hazardous.
<b>Pantothenic Acid</b>	The physiologically active form of co-enzyme A (co-A) which is involved in many metabolic pathways.	Improves aerobic capacity, may be an "anti-stress" vitamin.	<i>Inadequate evidence to support the claim.</i> No adverse effects have been reported.
<b>Phosphate Salts</b>	Essential mineral found in a variety of foods. A component of oxygenating enzymes and buffering systems.	Delays onset of fatigue, improves oxygen transport to muscles, and improves maximal aerobic capacity.	<i>Research results are ambiguous regarding impact on performance.</i> Gastrointestinal intolerance is a likely possibility. The phosphate content of soft drinks is high. If they are routinely consumed, further phosphate loading is not advised.

Does it Work?

DIETARY SUPPLEMENT	WHAT IT IS.	ERGOGENIC CLAIM	DOES IT WORK?
Sodium Bicarbonate	Baking soda.	Enhances aerobic performance, delays onset of fatigue by eliminating exercise induced accumulation of lactic acid in muscles.	<i>Ineffective for events lasting less than 30 seconds or more than 7 minutes.</i> No significant effect on aerobic activity or on upper body anaerobic activity. May be effective for high intensity activities between 30 seconds and 7 minutes. Possible adverse effects include gastro-intestinal distress and diarrhea. High doses or chronic use causes imbalances in sodium and hydration. Avoid if you have high blood pressure.
Vanadyl Sulfate	Trace mineral that may or may not be essential.	Increases lean body mass, enhances endurance.	<i>Inadequate evidence to support the claim.</i>
Vitamin C	A water-soluble vitamin, essential in metabolism and a powerful antioxidant.	May accelerate recovery from muscle soreness and serve to minimize heat stress.	<i>Research indicates that 500 to 1000 mg per day may reduce the incidence of upper respiratory tract infections after endurance events such as marathons and ultramarathons.</i> No adverse effects noted at these doses, but some sensitive people may develop intestinal distress or irritation. Supplementation necessary only if dietary intake is insufficient.
Wheat Germ, Wheat Germ Oil, Octacosanol	Active ingredient is octacosanol. Rich in vitamin E & other vitamins.	Increases endurance & improves reaction times.	<i>Inadequate evidence to support the claim.</i> No known adverse effects.
Yohimbe	Herbal extract derived from the bark of the African tree, Pausinystalia yohimbe.	Increases testosterone and lean muscle mass; inhibits fat accumulation in the lower half of the body.	<i>Classified by the FDA as an unsafe herb.</i> Effectiveness is unproven. Adverse effects include anxiety, panic attacks, hallucinations, elevations in blood pressure and heart rate, dizziness, headache, and skin flushing. It is a monoamine oxidase inhibitor and must be rigorously avoided by people who take prescription MAO inhibitors, as well as those who have hypotension, diabetes, schizophrenia, heart, liver, or kidney disease.

## You Can Choose Wisely

These guidelines can help you make good decisions about when to use a dietary supplement and what you can expect from it.

- ▲ Consult reliable nutrition and health information sources:
  - A dietitian, pharmacist, or primary health care provider at your local medical treatment facility.
- ▲ Check out military nutrition and health education resources:
  - HOOAH 4 Health <http://www.hooah4health.org>
  - U.S. Army Center for Health Promotion and Preventive Medicine <http://chppm-www.apgea.army.mil/dhwp>
  - Human Performance Laboratory, Uniformed Services University of Health Sciences <http://www.usuhs.mil/mim>
  - U.S. Air Force Prevention and Health Promotion <http://www.brooks.af.mil/web/af/altmed/HOMEFRAME.htm>
  - Navy Environmental Health Center <http://www.nehc.med.navy.mil/hp>
- ▲ Use Federal government nutrition and health education resources:
  - NIH Office of Dietary Supplements <http://dietary-supplements.info.nih.gov>
  - Department of Health and Human Services <http://www.healthfinder.gov>
  - U.S. Food and Drug Administration <http://vm.cfsan.fda.gov/~dms/supplmnt.html>
- ▲ Use information from a respected agency or organization, such as:
  - The American College of Sports Medicine <http://www.acsm.org>
  - The American Dietetic Association <http://www.eatright.org>
  - Nutrition Action Newsletter, Center for Science in the Public Interest <http://www.cspi.org>
  - Herb Research Foundation <http://www.herbs.org>
  - U.S. Pharmacopeia <http://www.usp.org>
  - Quackwatch <http://www.quackwatch.org>
- ▲ Look for consumer health education resources at major universities:
  - Tufts University Nutrition Navigator <http://www.navigator.tufts.edu>
  - University of California, Berkeley Wellness Letter <http://www.berkeleywellness.com/>
- ▲ Look for product information that is not associated with selling the product for profit, e.g. an article in a journal that doesn't advertise the product. Does the article's author:
  - Have an academic degree from an accredited university?
  - Work or collaborate with a leading university?
  - Belong to a prominent professional nutrition society?
  - Receive any compensation from the sale of the product?

### Answers to: Check Your Vitamin & Mineral IQ

**Answers appear: best source first, medium source 2nd, and least last.**

**Vitamin C (b,c,a)** Oranges are rich in vitamin C, as are all citrus fruits. Apple-a-day adherents might be surprised to learn that apples are not rich sources of vitamin C.

**Iron (b,c,a)** Red meats are high in the form of iron that is readily used by the body. Dairy products are low in the iron.

**Vitamin A (c,b,a)** Deep green and orange color should be your guide in selecting plant foods for vitamin A.

**Calcium (all three foods are equally good sources of calcium)** Lowfat dairy foods contain as much calcium as whole-milk foods.

**B-12 (none of these foods offers vitamin B-12)** Meat from animals is the only source of B-12.

**Thiamin (a,b,c)** Enriched grain products and whole-grains are good sources of thiamin.

**Vitamin E (c,b,a)** Vegetable oils are the best sources. Although shortening and margarine contain vitamin E, some of it is lost in the processing.

**Potassium (b,a,c)** Bananas are the richest in potassium, but all of these choices contain significant amounts of the mineral.

**Zinc (a,c,b)** Beef liver has far more zinc than the other two. All red meats are considered good sources of zinc.

**Riboflavin (b,a,c)** Milk is the only good source listed.

*A Performance Diet, not promises  
is your Nutrition Connection to Performance Power!*

## **In Summary**

- ▲ You can get all of the nutrients you need for performance and health by eating a variety of foods and drinking plenty of water.
- ▲ Balance your food intake and physical activity.
- ▲ Just because a little of something is good, it doesn't mean that more is better. Don't overdo any nutrient or dietary supplement. Taking excess amounts of a supplement won't help your performance; in fact it could harm your performance and health.
- ▲ No quick fix, magic potion or home remedy will significantly improve your performance without a performance diet and training.
- ▲ If you want to use dietary supplements, use those that are considered safe or effective because they've been proven through scientific investigation.
- ▲ If you have questions about dietary supplements, consult your primary health care provider, dietitian, or pharmacist.
- ▲ If you want to improve performance and health, you have to practice it every day, not just before a PT test or when it is convenient.
- ▲ Don't use dietary supplements in place of food.

## Notes